Title: Olympic Quadrilaterals

Brief Overview:

The teacher will read a picture book showing quadrilaterals. The students will construct, define, and describe the five quadrilaterals. The students will apply their geometric reasoning using state of the art technology or paper and pencil.

Link to Standards:

- **Communication** Students will demonstrate their ability to communicate mathematically. They will read, write, and discuss mathematics with language and the signs, symbols, and terms of the discipline.
- **Reasoning** Students will demonstrate their ability to solve mathematical problems with open-ended answers, problems which are solved in a cooperative atmosphere and problems which are solved with the use of technology. They will make conjectures, gather evidence, and build arguments.
- **Connections** Students will demonstrate their ability to connect mathematics topics within the discipline and with other disciplines.
- **Geometry & Spatial Sense** Students will demonstrate their ability to apply geometric relationships using one, two, and three dimensional objects.
- **Patterns & Relationships** Students will demonstrate their ability to recognize geometric relationships and will generalize a relationship from data.

Grade/Level:

Grades 4-5

Duration/Length:

This lesson will take 3 periods (60 min.).

Prerequisite Knowledge:

Students should have working knowledge of the following:

- A computer graphics program (if they choose to create the assessment on the computer)
- Informative Writing Format & Style

Objectives:

Students will:

- work cooperatively in groups.
- identify attributes of quadrilaterals: square, rectangle, parallelogram, rhombus, trapezoid.
- construct five quadrilaterals using manipulatives and technology or paper/pencil.
- write an informative essay describing quadrilaterals used in an Olympic Arena.

- distinguish among kinds of quadrilaterals.

Materials/Resources/Printed Materials:

- Chart paper/Magic Markers
- One Picture Book (any of the following will apply to activity):
  Shapes by Henry Pluckrose
  Shapes (no author) Delacorte Press 1991
  Anno's Mysterious Multiplying Jar by Mitsumasa Anno
  Magic Monsters Look for Shapes illustrated by Diana Magnuson
  Grandfather Tang's Story by Ann Tompert (Crown Publishers, 1990)
- Flex-Straws
- Computer Graphics Program or Construction Paper/Pencil/Markers
- Ruler
- Student Resources 1-4
- Teacher Resources 1-7

Development/Procedures:

- Prior to lesson, cut out shapes from Teacher Resources 1-5 for students to use as models for the attribute chart. Hand out chart paper, marker, and one quadrilateral cut-out to each group (there should be five groups). Instruct the students to leave the top line of the chart paper blank, glue the quadrilateral to the top of the chart paper, and list the attributes of the quadrilateral on the chart paper.

- Read a book from the list above to the students. Discuss each quadrilateral as it pertains to the book. Preview the book first to see how it applies to quadrilaterals. Some of the books may be used for identifying different quadrilaterals within everyday objects in the story.

- Have each group present their quadrilateral, showing it and discussing its attributes. Other groups, as well as the teacher, should comment on additional attributes and question attributes they feel do not apply. Changes can be made to the chart paper. Have the class determine the proper name for each quadrilateral and write it on top of the appropriate chart. Display charts in classroom for easy reference.

- Distribute the flex-straw sets (see Teacher Resource 6 for construction directions). Instruct the students to construct the five quadrilaterals using the straws. Students should refer to the charts to verify their constructions. Instruct students to draw the quadrilaterals in their math journal. Remind them to use a ruler when constructing the quadrilaterals. Students should label each quadrilateral in their journal and include a definition based on the charted attributes. The teacher should assess students by observing and questioning to determine if they have labeled, defined, and drawn quadrilaterals successfully.

Performance Assessment:

- After completion of display charts, use Student Resource 4 as a summary with a transparency of Teacher Resource 7.

- Read the following prompt to the students:

  The following people have walked into your architect firm to seek your advice on designing the next Olympic stadium. Shaquille O'Neal and Sheryl Swoops of the U.S. basketball teams want your help in designing a state-of-the-art basketball court. Shannon Miller and Jair Lynch of the U.S. gymnastics teams are seeking a new design for the 21st century gymnastics arena. Your job is to develop a design for either a gymnastics or basketball floor plan with seating. Please incorporate as many different quadrilaterals as possible. Use each of the five quadrilaterals at least once (square, rectangle, rhombus, parallelogram, and trapezoid) in designing your Olympic stadium. You may use as many quadrilaterals as you like in creating the stadium. Be creative, original, and have fun with your design!

- This assessment may be created in various ways. The computer may be used if certain software programs are available such as: MicroWorlds Project Builder, LogoWriter, ClarisWorks, or Microsoft Draw. The student work may be printed for display and saved on the disk for evaluation. An alternative to the computer is to have students cut out or draw quadrilaterals for the sports facility using construction paper and pencil.

- Hand out and discuss Olympic Stadium rubric with the students. See Student Resource 1. Review the rubric with the students prior to the task so they will be familiar with the expectations.

- Have the students create a floor plan with spectator seating using at least five quadrilaterals introduced in the lesson. For example, the student may use a rhombus to show the center court area where they 'jump ball' to start the game.

- Have the students share their designs with the class. Then display each design in the classroom or the school.

Extension/Follow Up:

- Hand out the writing prompt (Student Resource 2) and review it with the students. Discuss the format (essay), audience (world athletes), topic (new court or arena), and purpose (describing new facility to athletes) with students.

- Distribute and discuss the writing rubric (see Student Resource 3).

- The students will use the writing process as they complete the informative essay. They should use the drawing/printout of their sports facility as a reference.

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Olympic Quad Student Resource 1

Name_____

OLYMPIC DESIGN RUBRIC

Criteria

The student will:

__ Include in the drawing:

Basketball	**OR**	**Gymnastics**
Court		Mats
Backboard		Apparatus:
Center Court		Beams/Bars/Vaulting Horse
Spectator Seating		Spectator Seating

__ Make the design colorful, neat and realistic

__ Use a ruler for straight lines

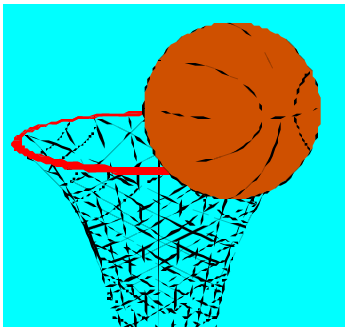
__ Accurately draw the **five** quadrilaterals in the drawing

__ Label the **five** quadrilaterals: **Square, Rectangle, Parallelogram, Trapezoid, and Rhombus**

To receive a **Gold Medal** you will have completed **all** five objectives listed above.

To receive a **Silver Medal** you will have completed **most** of the five objectives listed above.

To receive a **Bronze Medal** you will have completed a **few** of the five objectives.



Olympic Quad Student Resource 2

NAME_____

Olympic Writing Activity-Informative Essay

Wow!! You have just finished designing a fantastic new Olympic basketball court or gymnastics arena. Congratulations!! Athletes around the world are curious about the new facility. They have asked you to write an essay describing your creation.

In your informative essay, describe the layout of your court or arena. Make sure you specifically tell where and how you used each of the five quadrilaterals (square, rectangle, rhombus, parallelogram, and trapezoid). Finally, use your imagination in describing the colors and equipment of your sports building.

Since the best athletes in the world are breathlessly awaiting your essay, be sure to use correct capitalization, punctuation, spelling, and grammar. You may write your rough draft below.

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Olympic Quad Student Resource 3

Name _____

INFORMATIVE ESSAY RUBRIC

Criteria

The student will:

__ Include all elements of informative writing.

__ Use correct spelling, grammar, punctuation, and capitalization.

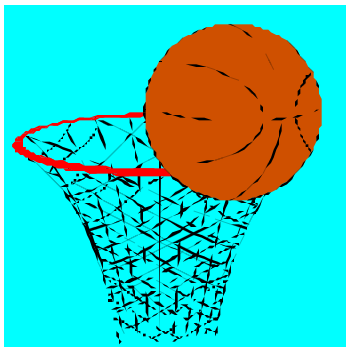
__ Use at least **five** sentences to describe the sports building they designed.

__ Include the names of each quadrilateral they used in creating their sports facility.

To receive a **Gold Medal**, the student will include **all** criteria in their informative essay.

To receive a **Silver Medal**, the student will include **most** of the criteria in their informative essay.

To receive a **Bronze Medal**, the student will include a **few** of the criteria in their informative essay.



Name _____

SPECIAL KINDS OF QUADRILATERALS

Directions: Fill in the blanks with what you have learned.

Quadrilateral, a polygon, with __ straight sides, and 4 angles whose sum is _____.

square, 4 sides are _____
all 4 angles equal 90 or _____ angles
opposite sides are _____
___ lines of symmetry

rectangle, 4 sides
_____ sides are equal
opposite sides are _____
all 4 angles equal _____ or right angles
___ lines of symmetry

rhombus, 4 sides are _____
opposite sides are _____
opposite _____ are equal
___ lines of symmetry

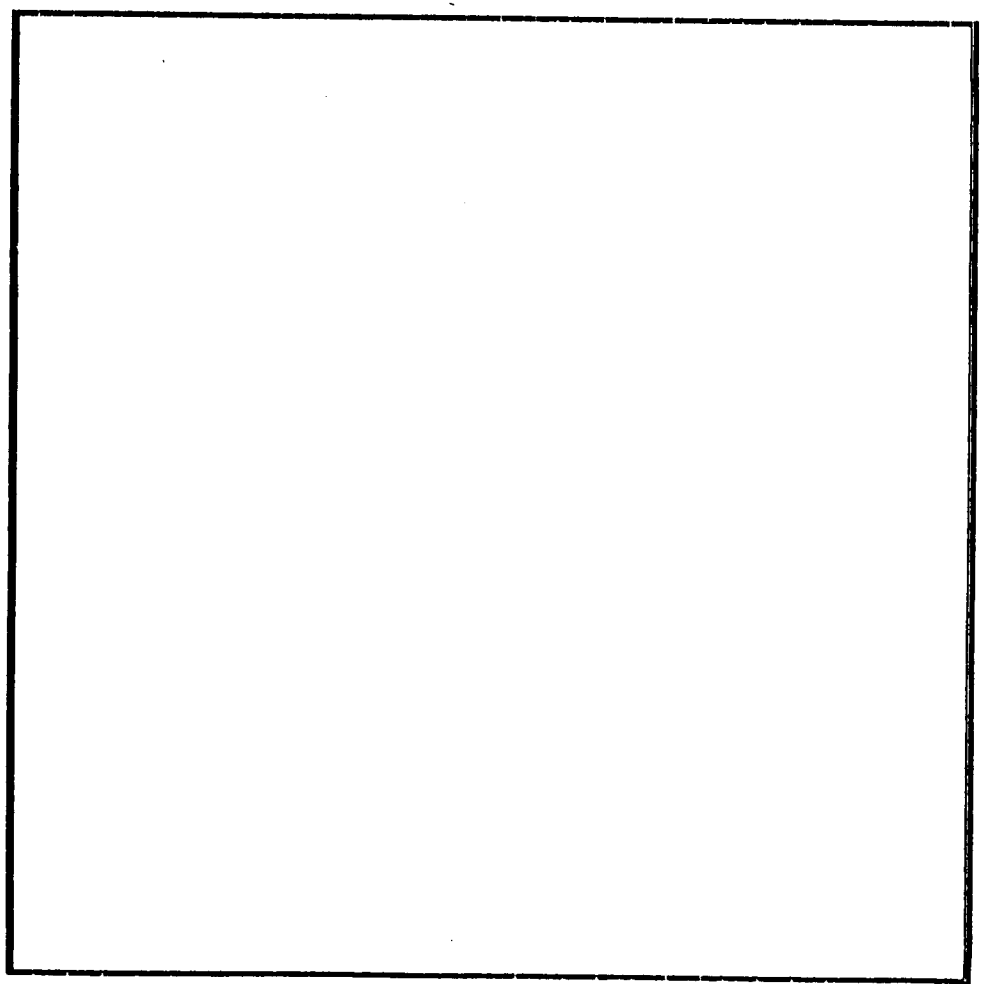
parallelogram, 4 sides
opposite sides are_____
opposite sides are _____
opposite angles are _____

___ lines of symmetry

trapezoid, 4 sides
only ___ pair of sides parallel

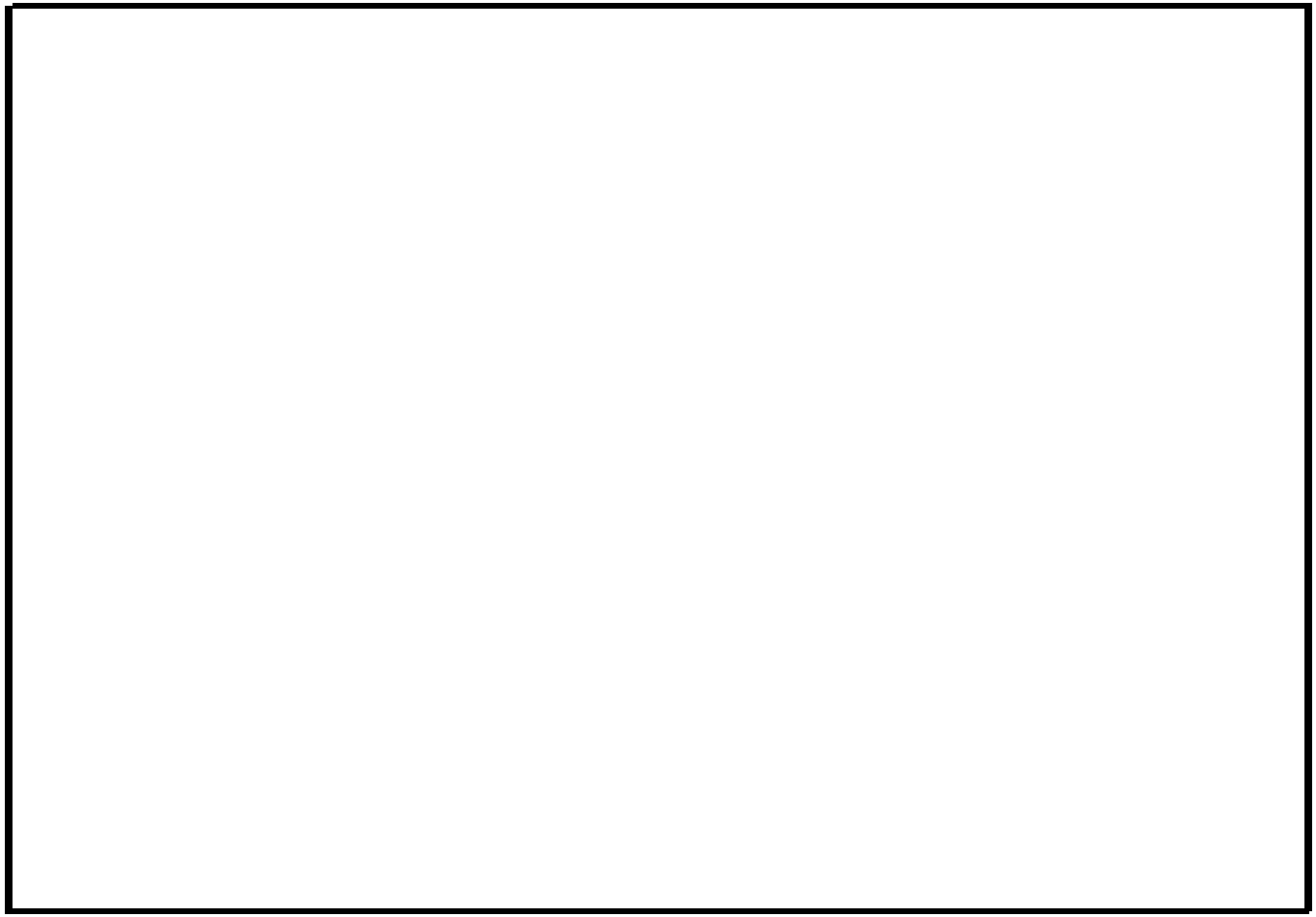
Olympic Quad Teacher Resource 1

Square

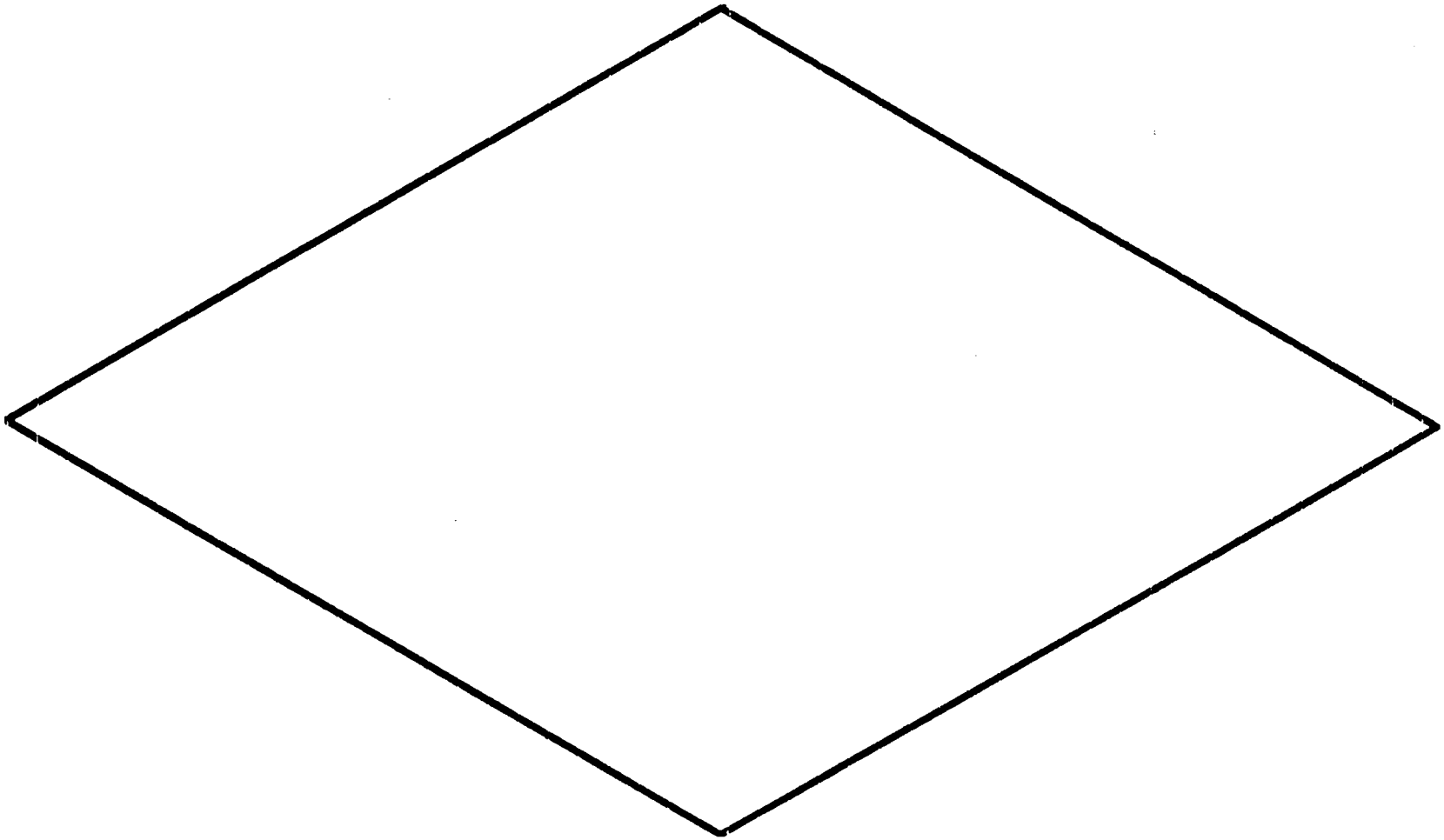


Olympic Quad Teacher Resource 2

Rectangle

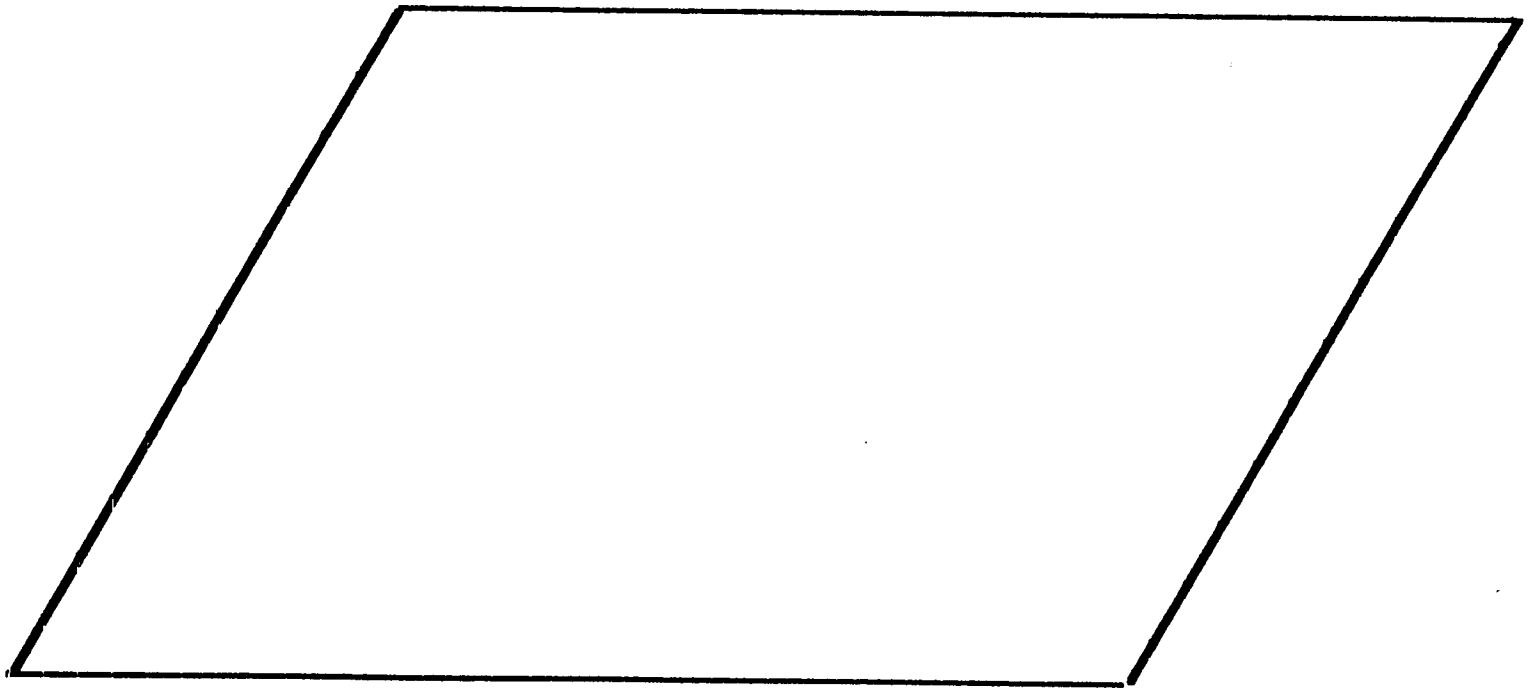


Olympic Quad Teacher Resource 3
Rhombus



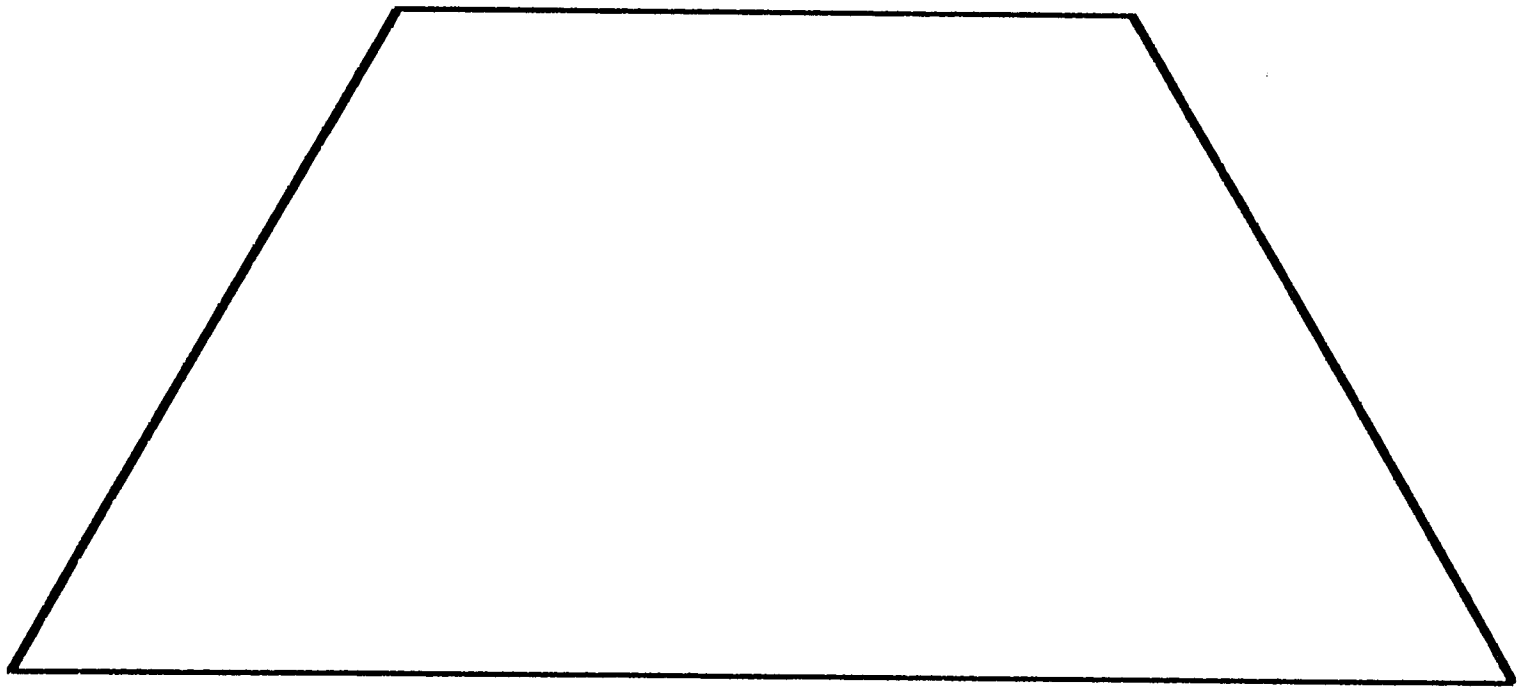
Olympic Quad Teacher Resource 4

Parallelogram



Olympic Quad Teacher Resource 5

Trapezoid

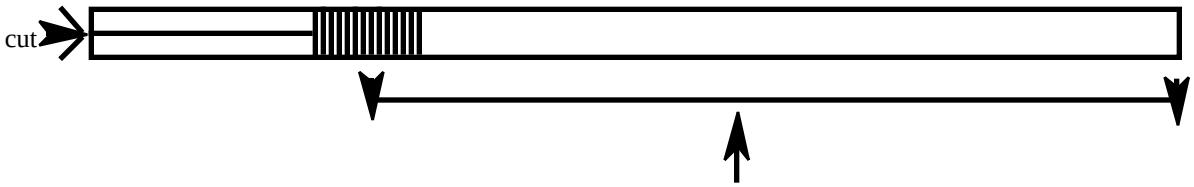


GEO-FLEX STRAW CONSTRUCTION

(Different Length Straws)

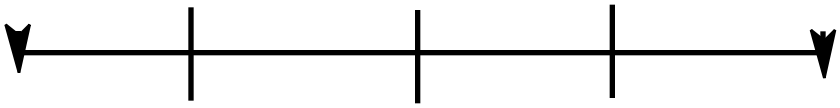
- **Purchase 60 flexible drinking straws for each kit you plan to make.**
- **Slit the drinking end of the straw from the edge to the flexible joint.**

- **Place the straw which is bent at the flex joint on a blank piece of paper so that the long end of the straw is touch the paper. Draw a line the length of the straw from the bottom edge to the flex joint.**

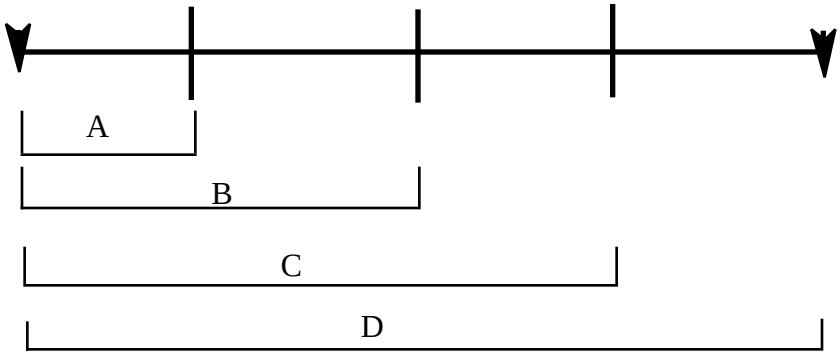


Line drawn to show length of long end of straw.

- **Draw marks on the line to divide it into four lengths.**



- **Make 15 of each length flex-straw by laying the straw on the line to determine where to cut.**



- **Place tape on each straw cut to indicate length:**
  A = green; B = yellow; C = red, and D = blue
- **Place straws in quart-sized ziplock bag.**

Adapted from Geometry with Flex Straws by Bette Kundert, Howard County Public Schools.

SPECIAL KINDS OF QUADRILATERALS

quadrilateral, a polygon, with 4 straight sides, and 4 angles whose sum is 360 .

square, 4 sides are equal
all 4 angles equal 90 or right angles
4 lines of symmetry
opposite sides are parallel

rectangle, 4 sides
opposite sides are equal
opposite sides are parallel
all 4 angles equal 90 or right angles
2 lines of symmetry

parallelogram, 4 sides
opposite sides are equal
opposite sides are parallel
opposite angles are equal
no lines of symmetry

rhombus, 4 sides are equal
opposite sides are parallel
opposite angles are equal
2 lines of symmetry

trapezoid, 4 sides
only 1 pair of sides parallel